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Development of software and analytical complex for brain activity monitoring during space flight

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Abstract

© SGEM2017. All rights reserved. The future manned space flights will be accompanied by collecting a significant amount of unique experimental data: electrocardiogram, encephalogram, myogram, and rheoencephalogram generated by human body under conditions of outer space. However, while systems of monitoring crew members' mental and physical performance capability are well developed, problems related to obtained data interpretation, which is necessary for predicting dramatic changes in human behavior or health status and for maintaining normal life-support, remain relevant. In their earlier works the authors represented the software for studying physiological and pathological human conditions on the Earth using multi-parametric analysis of time signals captured by the corresponding measuring equipment. At the core of that software there are original concepts taken from complex systems physics, non-equilibrium statistical physics, and numerical algorithms and software for their combined use developed by the authors. As theoretical approaches the authors are using statistical memory functions formalism, flicker-noise spectroscopy, standard capabilities of mathematical physics and probability theory. The specified approaches allow obtaining a large amount of quantified parameters and qualitative characteristics sufficient for separating physiological and pathological human conditions. The experimental data is obtained in long-term cooperating with the leading Russian and foreign laboratories and research and development centers. The present work focuses on prospects of studying medical and biological aspects of outer space influence on human behavior and condition by developing the existing theoretical and software capabilities related to establishing physical mechanisms reflecting generation of anomalous states of different system of the human body, particularly central nervous system. This is about development of software analytical complex adapted to physiological condition monitoring, revealing and predicting extreme human conditions during space flight. The immediate object of the proposed complex is to revealing fundamental characteristics of man's cerebral cortex functional states, accumulating knowledge base and parameters describing anomalous changes in central nervous system. The ultimate goal is development of criteria for diagnosing and predicting various pathological processes, and, in further, combined use of the obtained results to improve medical diagnostic equipment.

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Keywords

Bio analytical techniques, Brain activity & human CNS, Software and analytical complex, Space

flight, Time series analysis

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